like lightning discharges, and numerous brush discharges, which fill the air between the terminals.

It seemed an interesting question to ascertain whether the spectrum of atmospheric air obtained by means of the great electromotive force of three million volts would show more lines than are produced by lower voltages. Photographs were therefore taken between brass terminals of the spectrum produced by the spark; and comparison spectra between zinc and copper terminals were obtained by means of the spark of a transformer giving about one hundred thousand volts, with large quantity of electricity. The characteristic atmospheric lines can be seen common to the three spectra. The photograph, however, of the spark produced by three million volts (A, Fig. 6) shows an absence of metallic lines, and must closely resemble, I believe, the spectrum of lightning. The photographs were taken by means of a Browning direct vision spectroscope, on orthochromatic plates, which were sensitive from the D line to the neighbourhood of the H lines. It is interesting to discover that no new lines apparently come out by the employment of very high electromotive force.

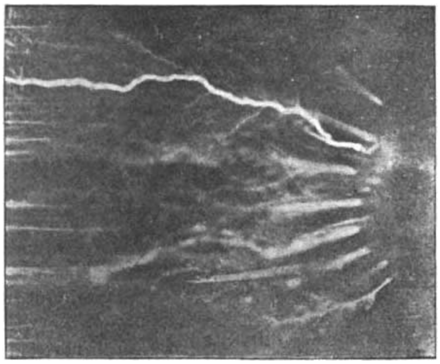
FIG. 5.

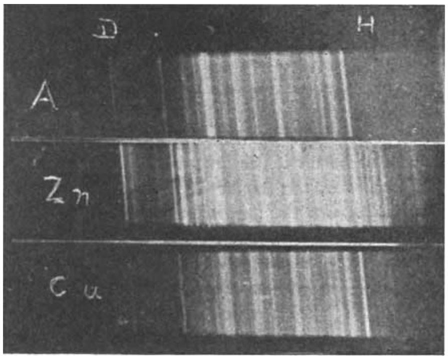

FIG. 6.

The condensers of the apparatus, which develops three million volts, were at first raised only six inches above the floor. When the room was darkened, luminous discharges were observed, which passed from the edges of the condensers to the floor. The condensers were then lifted to a height of three feet: these brush discharges were much lessened, and the length of the electrical discharges between the terminals was increased. There was still considerable loss; for sparks could be drawn from the neighbouring gas-pipes, and even from the brick walls. In order to obtain discharges in ordinary air of greater length than seven feet, by the employment of three million volts, the entire apparatus should be lifted to a considerable height above the earth, and should be remote from neighbouring objects.

The inductive effect of such high tension extends to a remarkable distance. Photographic plates contained in ordinary holders, held six to ten feet from the terminals of the apparatus, show on development arborescent figures, evidently caused by inductive electrical discharges. X-ray photographs of the skeleton of the hand can be taken by a single discharge passing through a Crookes' tube. The tube, however, is spoiled in the operation. The discharge will penetrate a space so highly rarefied that an eight-inch spark from a powerful Ruhmkorf coil cannot pass through it. If a Crookes' tube could be constructed which would resist the destructive effect of the discharge, great penetrating effect could undoubtedly be obtained.

NOTES.

THE new Session of Parliament was opened on Tuesday with the customary formalities. The legislative plans of the Government include, as stated in the Speech from the Throne to the Commons, "a measure for the establishment of a Board for the administration of primary, secondary, and technical education in England and Wales."

AT the last meeting of the Institution of Electrical Engineers, Lord Kelvin was elected an honorary member of the Institution. Lord Kelvin is the oldest surviving past president of the Institution, having held the office of president in 1874, when it was the Society of Telegraph Engineers, and again in 1889, which was the first year after the society had received the designation that it now bears.

IT is reported that the Russian Government contemplates sending an expedition to Samarkand and Merv, to investigate and report upon the recent outbreaks of malarial fever which have greatly alarmed the inhabitants of those districts.

WE learn from *Science* that the sculptor Herr Ernst Herter has completed the statue of von Helmholtz, which is to be erected in the court of the University of Berlin, between the statues of the two Humboldts. The monument will be unveiled in the spring.

M. ROUX has been elected a member of the Section of Rural Economy of the Paris Academy of Sciences, in succession to the late M. Aimé Girard.

M. E. A. MARTEL, general secretary of the Paris Société de spéléologie, has been awarded the grand medal of honour of the Société de topographie.

PROF. PERCY FRANKLAND, F.R.S., has been elected president of the Physics, Chemistry, and Biology Section of the Sanitary Institute, for the congress to be held in Southampton in August next.

THE Earl of Rosse will give an address upon the heat of the moon, at the Camera Club this evening.

THE annual general meeting of the Royal Horticultural Society will be held on Tuesday next, February 14. The annual meeting of the Royal Photographic Society will also be held on the same day.

THE annual general meeting of the Malacological Society will be held to-morrow (Friday), and a presidential address will be delivered by Lieut.-Colonel H. H. Godwin-Austen, F.R.S.

THE death is announced of Major J. Hotchkiss, who in 1895 was president of the Section of Geology of the American Association for the Advancement of Science, and was the author of a number of papers on economic geology and engineering.

THE annual meeting of the Institution of Naval Architects will take place on Wednesday, March 22, and the two following days, at the Society of Arts. The Right Hon. the Earl of Hopetoun, G.C.M.G., president, will occupy the chair.

COLONEL EDMOND BAINBRIDGE, C.B., Royal Artillery, Superintendent of the Royal Laboratory, Woolwich, has been appointed to succeed the late Sir William Anderson, K.C.B., as head of the Ordnance Factories.

Malpighia records the death of two distinguished Italian botanists, Prof. T. Caruel, director of the Museum of the Botanical Garden at Florence, a copious writer on many branches of botany; and Dr. G. Gibelli, Professor of Botany at Turin.

MR. ASA VAN WORMER (says the *American Naturalist*), a wealthy merchant of Cincinnati, has presented the sum of 56,000 dollars to the University of Cincinnati, for the erection of a fire-proof library.

Cosmos for January 28 contains an article by M. Larbalétrier, giving an account of the cultivation of the truffle in France, with a table showing the importations and exportations for the years 1895–1897. During the year 1897 France exported 193,376 kil. of truffles, valued at 1,740,380 francs; of these, 86,000 kil. came to this country. A map shows the areas both of the natural production and of the cultivation of the esculent. With the exception of the culture in the neighbourhood of Paris, these are entirely in the southern and, especially, in the south-eastern departments.

IT is announced, by the *Geographical Journal*, that considerable progress has been made with the preparation, for publication, of the extensive scientific material collected during the voyage of the *Fram*, and that there is a likelihood that the first volume of memoirs will be issued during the coming summer or autumn. The collection will be in quarto form, and the separate memoirs will be the work of a number of specialists in the subjects treated of, each being paged separately. The total number will probably be about twenty, forming from three to five volumes. The memoirs will be published at the expense of the Nansen Fund for the advancement of science.

AN effort is being made to introduce into this country the Nodon-Bretonneau method for seasoning wood by means of electricity. Upon this system the timber to be seasoned is placed in a large tank and immersed, all but an inch or two, in a solution containing 10 per cent. of borax, 5 of resin, and 0·75 of carbonate of soda. The lead plate upon which it rests is connected to the positive pole of a dynamo, and the negative pole being attached to a similar plate arranged on its upper surface so as to give good electrical contact, the circuit is completed through the wood. Under the influence of the current the sap appears to rise to the surface of the bath, while the aseptic borax and resin solution takes its place in the pores of the wood. This part of the process requires from five to eight hours for its completion, and then the wood is removed and dried either by artificial or natural means. In the latter case a fortnight's exposure in summer weather is said to render it as well-seasoned as storage in the usual way for five years.

THE *British Medical Journal* publishes the following statement:—A somewhat mysterious communication was made last week to the Académie de Médecine. It was to the effect that M. Jaubert, who is a chemist formerly attached to the École Polytechnique, had succeeded in finding a substance which, when used in proper proportion, was capable of removing from the air of a closed chamber the carbonic acid, watery vapour, and other irrespirable products produced by a living animal enclosed in the chamber, while at the same time giving out "automatically in exchange the mathematically exact quantity of oxygen required." Two experiments were made by Dr. Laborde, the one on a guinea-pig under a bell jar, the other on M. Jaubert's brother, who wore a tightly-fitted respiratory mask. The nature of the substance is not mentioned, the only indication being that it is the lightest "reservoir" of oxygen in existence. The note is published only to obtain priority for the discoverer; but we are told that the research has been in progress since May last, with the approval and assistance of the French Ministry of the Marine, which was interested in M. Jaubert's scheme because it promised to be useful in submarine boats and in diving-bells. It is stated that three or four kilograms of this substance is enough to keep a healthy adult alive for twenty-four hours in a space hermetically closed. M. Laborde thinks that the substance will be of use also in medicine, since a few grams—an amount which can be easily carried in a waistcoat pocket—would at once yield several decalitres of very pure oxygen gas.

THE *British Food Journal and Analytical Review* is the title of a new monthly publication, which has for its object the discussion of all matters of general interest connected with adulteration and fraudulent trading. Arrangements have been made whereby the British Analytical Control will have this journal as its press organ. For the enlightenment of those who do not know what is meant by the "British Analytical Control," we are informed that it is a system of permanent control and guarantee in relation to food products and to other articles of public necessity and utility, which has been established in Great Britain and the Colonies and Dependencies of the Crown. There can be no doubt that such an association, established as it is with the approval and co-operation of a number of leading public analysts and other scientific men, is capable of doing most useful work in bringing public opinion to bear upon this important subject.

A RECENT number of the *Centralblatt für Bakteriologie* contains a paper on the vitality of the typhoid bacillus in milk and butter, by Messrs. Bolley and Field, of the Government Experiment Station for North Dakota, U.S.A. The butter used in these investigations was derived from an ordinary creamery, and contained one ounce of salt per pound. Ten days appears to be the longest period of time over which typhoid bacilli introduced direct into butter could be detected. When, however, the cream was infected with typhoid germs before churning, the latter were discovered in butter even after three months. Typhoid bacilli do not apparently make any marked growth in butter if the butter-milk is thoroughly worked out of it; if, however, the latter is left in to any extent, the bacilli take advantage of the mixture and multiply. In sterilised milk typhoid bacteria can exist for upwards of four months, and, inoculated into ordinary milk freshly drawn, they have been demonstrated as long as three months. No types of bacteria were met with in milk which proved capable of overcoming the typhoid bacillus; even when inoculated in comparatively small quantities into sour milk, it took well-nigh complete possession of the liquid becoming almost a pure culture. These experiments furnish yet another warning, to those concerned with the conduct of our dairy supplies, of the supreme importance of vigilance in all matters connected with the manufacture and distribution of such easily-infected articles of food as milk and butter.

THE *Journal* of Grahamstown (Cape of Good Hope) refers to an interesting return published by the Department for Agriculture, showing the ravages of rinderpest in the Cape Colony, and the results of the highly creditable battle waged against it by our officials. From it we learn that the proportion of cattle infected (including those inoculated) was 98 per cent. of the whole; the number that perished were 35 per cent., and those saved were 65 per cent. Various systems of inoculation were used, as that of Dr. Koch, the improved method elaborated by Dr. Edington, and the process of Drs. Turner and Kolle. In some districts all three were in operation. In twenty-three districts, as shown by the printed returns, 393,777 head of cattle were inoculated under Dr. Edington's system, the resultant mortality being 32,464, or only 8¼ per cent. Thus more than 360,000 cattle were saved, or over *two millions sterling* in value, by the application of the glycerinated bile process.

WE are glad to notice, from a short report by Mr. Alex. Meek, that the Northumberland Sea Fisheries Committee has established some connection with the Durham College of Science, and that a certain amount of scientific work is now being carried on in the marine laboratory at Cullercoats. The report is chiefly occupied with the results of the trawling expeditions carried on in the summer of 1898 by Mr. John Dent in the steamer *Livingstone*. The hauls seem to have been comparatively few in number—probably too few as yet in each year to justify any conclusions drawn from the curves given. The report ends with an interesting account of the mussel cultivation carried on by Major Browne at Budle Bay, on the Northumberland coast. As the fishing boats of the neighbourhood require about 1500 tons annually for bait, and as all of this, with the exception of 200 tons supplied by the Budle Bay farm, has to be imported from a distance, it seems as if mussel culture on the Northumberland coast ought to be an industry with a future before it.

INVESTIGATIONS carried on by the New York State Museum and the U.S. Fish Commission, lead Mr. T. H. Bean to conclude that marine fishes now certainly known in the New York fauna represent 200 species. The fresh waters contain 116 species, and there are, besides, thirteen anadromous forms. The list might be further increased by the addition of nineteen, including forms doubtfully assigned to the fauna, which would bring the total up to 348 species. Mr. Bean remarks that no systematic account of the fishes has been published since 1842, and many large regions of the State are almost, or altogether, unknown to the ichthyologist.

COMMENTING upon photographs of ribbon lightning obtained by the Rev. J. Stewart-Smith, in the U.S. *Monthly Weather Review*, Prof. Cleveland Abbe remarks that they are not taken by moving the camera during exposure. He points out that a discharge of lightning is too fleeting to be influenced by the motion of the camera. With artificial oscillatory discharges one may so control the time of the discharges and the motion of the sensitive film as to produce the appearance of a ribbon; but no motion of the camera seems likely to explain the many details in these ribbon photographs of natural lightning. On the contrary, Prof. Abbe thinks there is one flash on Mr. Stewart-Smith's plate that has every indication of being certainly an oscillatory discharge, showing lines of flow identical with those photographed by Prof. Trowbridge at Cambridge, Massachusetts, and fully maintaining his conclusion, which was also that of Prof. Joseph Henry and J. Ogden Rood, that the lightning flash is an oscillatory discharge, repeated frequently to and fro within the crack in the air that is opened by the first discharge. The whole process requires but a few millionths of a second, and the motion of the camera within that short time is insignificant.

WE have received from the Government Astronomer of New South Wales a copy of the "Results of Rain, River and Evaporation Observations" made in that Colony during 1897, containing monthly and annual totals of rainfall at 1518 stations, and the annual rainfall at all stations with three and up to fourteen years' records, with much other useful information, and accompanied by maps showing the tabular results very clearly at a glance. This system, under the careful superintendence of Mr. Russell, has become one of the most perfect that exists, and it is satisfactory to find that the author is able to state that the importance of the work is being recognised every year by a wider circle; no less than 1450 of the observers being volunteers. The average rainfall for the whole Colony during 1897 was 18·89 inches, being 25 per cent. less than the average for the previous twenty-four years. In the catchment of the river Darling the average was 19·75 inches, and in that of the Murray 17·77 inches. In parts of the Colony, there has been an abundance of rain; in others, the intensity of drought.

DR. PAUL BERGHOLZ has sent us a translation into the German language of the late Father B. Viñes' paper entitled "Investigation of the cyclonic circulation and the translatory movement of West Indian hurricanes." The original work was in Spanish, and was translated into English by Dr. C. Finley, of Havana, for presentation to the Meteorological Congress held at Chicago in August 1893. It was recently published by the U.S. Weather Bureau, and briefly noticed in our columns. The investigation is held in such high esteem, as probably the most satisfactory statement of the laws and phenomena of these storms which has yet been made, that Dr. Bergholz has rendered good service to the science of meteorology in preparing an independent translation for the use of German readers. He has also carefully revised it, and rendered it more useful by the publication of several charts showing the zones of the tracks of the storms in the various months. The translation appears in the *Marine-Rundschau*, 1898.

THE Italian Central Meteorological Office is apparently reducing the extent of its publications—not that the number of observing stations is decreasing, for in the last published *Annali*, for 1896, Part ii., they reach 392; but that only ten-day, monthly and annual means are given for temperature and rainfall, together with summaries of the general state of the weather. These results are arranged according to provinces, and in the alphabetical order of the stations. A separate volume of the *Annali* (Part i.) contains, in the same way as in the French Service, some valuable discussions of the detailed observations, including earthquake phenomena. The last published part of this series (for 1895) contains a discussion of the observations of the meteorological observatory on Mount Etna, situated at 2942 metres above sea-level.

THE Geological Survey of Western Australia has issued a *Bulletin* (No. 2) containing two reports by Mr. R. Neil Smith. The first relates to the state of mining in the Kimberley district, and in it the author points out that very little work has been done, except in a few mines, since 1891. The gold-field is evidently not suitable for large companies, but simply for the gaining of a precarious living by working miners. Patches of alluvial gold, and small veins of uncertain continuance, are found at rare intervals, and these may pay well for a few months. The second report deals with the question of obtaining artesian water between the Pilbarra gold-fields and the Great Desert, and the author concludes that the comparatively small superficial extent of the impervious ranges, and the thinness and probable want of continuity of the water-bearing strata, are unfavourable to any system of artesian wells.

QUARTZ mining in Victoria, Australia, is now being carried on in a very economical manner. The methods of mining the stone underground and bringing it to the surface have been reduced to a science, and it is probably nowhere more economically done than in Victoria. There is much room for improvement, though, in the method of milling the ore. The half-yearly statements of several of the public companies, recently issued, give interesting details, and show what can be done by systematic and careful management. It is said that anything over 3 dwts. to the ton would be regarded as comparatively rich. One company crushed for the half-year 6900 tons for 911 ozs. 1 dwt. of gold, an average of 2 dwts. 15 grs. per ton. This gave a profit on actual working expenses of 1030*l.* 17*s.* 1*d.* The cost of treating the stone had been only 6*s.* 9*d.* per ton, against 7*s.* 0¾*d.* the previous half-year.

FROM the Geological Survey of Queensland we have received a copy of *Bulletin* No. 10, comprising "Six Reports on the Geological Features of part of the district to be traversed by the proposed Transcontinental Railway," by Mr. Robert L. Jack, Government Geologist. These Reports were issued in a Parliamentary paper in 1885, and with an appendix consisting of a list of fossils named by Dr. H. Woodward and Mr. R. Etheridge, jun.; but, having for some time been out of print, the Reports have now been reprinted with notes and additions. They deal chiefly with the gold-mining and copper-mining of the Western Downs, and the Cloncurry and Leichhardt districts. We have received also *Bulletin* No. 8, a "Report on the Gold Mines at the Fanning and Mount Success, 1898," by Mr. W. H. Rands, Assistant Government Geologist. The Far Fanning has been worked for many years past in a desultory fashion, but last year some increased activity took place. Mr. Rands, however, reports that there is a great lack of really *bonâ fide* work; the deposits are worked irregularly, and the smallness of the crushings, compared with the large faces of so-called crushing material, shows that a system of working which consists in picking out the best stone has been largely carried on.

SOME interesting observations on the hibernation of ants are described by Miss Theodora Smith in the *Halifax Naturalist*—the organ of the Halifax Scientific Society. Miss Smith had a nest of *Myrmica scabrinodis*, and she placed it in a cold room (in an empty house), where the temperature was about equal to that of the outside air. Under the nest she placed two artificial nests, one of soil and moss, and the other of pure yellow clay—the latter being at the bottom. The combination of nests thus resembled the natural order of things. Observations of the behaviour of the ants under different conditions of temperature showed that the ants went into the clay soil nest for warmth—that is, when the weather was cold—but usually preferred to remain in the mossy black soil when warm enough for them to do so. Miss Smith points out that though in the summer and spring months the young are separated according to size; *i.e.* the eggs are placed in one chamber, the small larvæ in another, those a little larger in another, while the nymph larvæ are separated entirely from the rest, in the winter this division of the relative sizes is not found, all the larvæ, of whatever size, being placed together in an inner chamber. It is suggested that this may be for warmth, and it may be that the young do not require the special attention given to them during more active times of growth.

UNDER the auspices of the British Fire Prevention Committee a detailed report has been brought out by Messrs. Gustave Kaufman, Emil Swensson, and F. L. Garlinghouse, on the Horne Building Fire, of Pittsburgh, U.S.A., which, in approximately two hours from the time of discovery, destroyed three large buildings on opposite sides of Penn Avenue, while damaging half a dozen smaller adjacent structures. An examination of the damage done has led the Board to draw the following conclusions: (1) In buildings of about this height (roughly 115 feet), the distortion of the steel framework, due to the heat of the fire, cannot be sufficient to work any serious damage, nor is it probable that at any time would connection rivets be sheared off. This conclusion is arrived at for the reason that there is no probability that any future fire will be fiercer than the one at issue. (2) The method of fastening fire-proofing to the underside of beams with sheet-iron strips should be discarded. (3) It cannot be too often reiterated that open front buildings like this should be protected from external fires by metal shutters, and also that all shafts should be provided with metal doors which can be readily closed at all floors. (4) The most important lesson taught by this fire was the lack of strength developed by the fire-clay proofing. The building was permitted to move in any direction without any material restrictions by the fire-proofing. The floor arches showed by the scaling off of the lower webs that they were unable to offer any sufficient force to counteract the tendency to lateral motion. (5) The column protection, although composed of the very best obtainable kind of fire-clay tile, was not of sufficient strength. The authors strongly advocate the use of first-class concrete as a fire-resisting material for encasing the columns, girders, and other steel constructions.

REGARDING "soul" as the highest intellectual faculties, Dr. D. G. Brinton refers in *Science* to Dr. C. Clapham's arguments as to its position in the body. Savages believe that the "soul" is in the liver or the heart; cynics suggest that it is in the stomach; phrenologists regard the front part of the brain as the seat of intellect; but the most advanced physiologists are now inclined to teach that the posterior cerebral lobes have the highest intellectual value. In connection with this view, Dr. Clapham has pointed out that man has the most highly developed posterior lobes, and this is conspicuous in men of marked ability and in the highest races. In idiots the lobes are imperfectly developed, and in chronic dementia these portions of the brain reveal frequent lesions.

MESSRS. R. FRIEDLÄNDER AND SON, Berlin, have just issued a classified catalogue of physical books, papers, and periodicals which they have for sale.

MESSRS. H. T. SOPPITT and C. Crossland give, in the *Yorkshire Naturalist* for January, a list of seven new British Fungi found in West Yorkshire, including one new to science, *Saccolabus granulospermus*.

AN address on "Medicine in the Nineteenth Century," delivered by Prof. Clifford Allbutt before the Johns Hopkins University, Baltimore, in October last, is printed in the *Bulletin* of the Johns Hopkins Hospital.

THE twenty-ninth annual report of the Wellington College Natural Science Society has been received. It comprises abstracts of addresses delivered before the Society, meteorological records, and brief references to the work of the members of the various sections.

AN illustrated article on the Natural History Museum at South Kensington is contributed to *Naturen*—an illustrated monthly magazine of popular natural history—by the editor, Dr. J. Brunchorst. The article is one of a series on museums. *Naturen* is published at Bergen, by John Grieg.

A VALUABLE paper upon the origin and history of white and so-called wild cattle is contributed to the *Transactions* of the Natural History Society of Glasgow (vol. v. new series, 1897–98), by Mr. R. Hedger Wallace. Among other papers is one by Mr. G. F. Scott-Elliot, on limits to the range of plant species.

MR. H. LING ROTH contributes some interesting notes on Benin customs to the *Internationales Archiv für Ethnographie* (vol. xi. 1898). The notes are based upon information given by officials of the lately-deposed King of Benin, and a comparison is made between the statements of the court officials and the records of early chroniclers. Another paper by Mr. Ling Roth, on primitive art from Benin, appeared in *The Studio* in December 1898.

THE Trustees of the British Museum have published the first volume of the monograph of the *Lepidoptera Phalaenae* which they have in preparation. The volume is a "Catalogue of the *Syntomidae* in the British Museum," by Sir George F. Hampson, Bart. In addition to the numerous species of *Syntomidae* in the British Museum Collection, other rich collections have been lent for examination. Coloured illustrations of new or hitherto inadequately figured species are published separately, in order not to add to the cost of the catalogue.

Bulletin vol. iii. No. 5 (October 1898) of the College of Agriculture of the Imperial University of Tokyo, now published entirely in English, is mainly devoted to the discussion of various questions connected with the cultivation of rice. It contains, besides, papers on the formation of proteids and the assimilation of nitrates by phanerogams in the absence of light, by Prof. Suzuki; and on the properties of cocoons of the various silkworm races of Japan, by Prof. Kawara.

THE Hull Scientific and Field Naturalists' Club has just issued the first number of a series of annual *Transactions*, containing papers brought before the members at the fortnightly meetings. It is intended to publish original papers and notes upon local natural history; and if every local society of naturalists did the same, and placed their observations on record, much valuable scientific material would be accumulated.

A READY means of obtaining a number of copies of an illustration is so often required in the scientific world that many men of science will be glad to have their attention called to an appliance called the Photo-Autocopyist, which enables this to be done. The apparatus and method are very simple, but a little experience is necessary to produce good effects. The negative of which copies are wanted is printed in the usual way upon a stout paper having a gelatine surface, which has been previously sensitised by immersion for a few minutes in a 3 per cent. solution of bichromate of potash, and then dried. The gelatinised sheet is taken from the frame when sufficiently printed and washed. It then constitutes the printing surface, which is stretched upon a frame, and inked with an ink roller, the ink only adhering to the indented parts which have been acted upon through the negative. Ordinary paper is then placed upon the inked surface, pressed in a copying press, and taken out at once. A finished, permanent, print is thus obtained in a minute or two, and to procure others it is only necessary to ink the surface again and put it under the press with another sheet of paper. The process is a simple modification of the Collotype method of reproduction, and as a means of quickly obtaining permanent prints from photographic negatives it should prove extremely useful.

SEVERAL new editions of well-known works have reached us during the past few days. The second edition of Prof. W. C. Unwin's "Testing of Materials of Construction" (a text-book for the engineering laboratory, and a collection of the results of experiment) has come from Messrs. Longmans, Green, and Co.—Pages 273 to 672 of the English version (third edition) of Carl Busley's "Marine Steam Engine," translated by Mr. H. A. B. Cole, have been published by Messrs. Lipsius and Tischer, Kiel and Leipzig (London: H. Grevel and Co.), with an atlas containing plates 9-45. It is expected that the third (and concluding) part, consisting of only a few sheets and plates, will be published in the course of the present year. The completed work will be a manual and book of reference for all who are concerned with steam navigation.—Under the title "An Intermediate Text-book of Geology," Messrs. W. Blackwood and Sons have published a text book by Prof. C. Lapworth, founded upon Page's "Introductory Text-book of Geology." With the latter title, the work passed through twelve editions, several of which were prepared by Prof. Lapworth, and in its new form it should be even more successful. The text has been rewritten, with the exception of a few parts, and nearly a hundred pages have been added. Special attention has been paid to the subject of the geographical distribution of the geological formations at home and abroad. Systematic students of geology will find the new volume very serviceable.—A third edition of "Gordon in Central Africa, 1874-1879," edited by Dr. G. Birkbeck Hill, has been published by Messrs. Macmillan and Co., Ltd.

A SERIES of tables, showing the differences between Greenwich mean time and the civil times used in various parts of the world, compiled by Prof. John Milne, F.R.S., is published in the February number of the *Geographical Journal*. The names of places in the tables are arranged in alphabetical order, and the amount by which the time used at each is fast or slow of Greenwich mean time is indicated. Some of the descriptive notes are interesting. It is pointed out that the Chinese at most places use an approximate apparent solar time, obtained from sun-dials. At Tientsin the civil time is determined by the municipal chronometer, which, however, has sometimes been known to have an error of three minutes. The Persians keep sun time, watches being set at sunset. In Teheran there is a midday gun fired by the time shown on a sun-dial. But a few minutes makes no difference in Persia; the railway trains start when full or when required, and Persian telegraphists do not give time of issue or receipt of telegrams.

THE constancy of composition of natural gas is a question of some practical importance to manufacturers in the Pittsburgh region, and as the opinion has been frequently expressed that natural gas fluctuates in its heating power, it seemed worth while to see if these changes in composition really occur. The results of an investigation by Mr. F. C. Phillips on this subject are given in the *Proceedings* of the American Academy of Arts and Sciences for November 1898. Since the nitrogen in the gas appeared to be the most readily determined constituent, attention was first directed to this element, and an apparatus devised by which comparatively large quantities of the gas could be completely burnt by red-hot copper oxide, and the residual nitrogen collected and measured. The results of duplicate determinations on the same sample of gas were closely concordant, the variations not exceeding in any case 0·03 per cent.; but since samples of gas from the same well, collected at different times, showed variations of nearly 2 per cent., it would appear that fluctuations in the composition of natural gas do really occur.

THE additions to the Zoological Society's Gardens during the past week include a Rhesus Monkey (*Macacus rhesus*, ♀) from India, presented by Mrs. Emily Price; a Bonnet Monkey (*Macacus sinicus*, ♂) from India, presented by Miss May Wieland; a Sooty Mangabey (*Cercocebus fuliginosus*, ♂) from West Africa, presented by Mr. B. Stewart; a Black-faced Spider Monkey (*Ateles ater*) from Eastern Peru, presented by Captain Chas. T. Swain; a Vulpine Phalanger (*Trichosurus vulpecula*, ♀) from Australia, presented by Mr. W. J. Matthews; a Golden-backed Weaver Bird (*Pyromelana aurea*, ♂) from West Africa, presented by Mr. A. F. Wiener; three Common Marmosets (*Hapale jacchus*) from South-east Brazil, a Great Kangaroo (*Macropus giganteus*, ♀), a Great Wallaroo (*Macropus robustus*) from Australia, a West Indian Agouti (*Dasyprocta cristata*) from the West Indies, deposited; two Indian Chevrotains (*Tragulus meminna*) from India, five Sacred Kingfishers (*Halcyon sancta*), four Lace Monitors (*Varanus varius*) from Australia, a Black-throated Diver (*Colymbus arcticus*) from Holland, purchased; a Red Kangaroo (*Macropus rufus*, ♂), five Puff Adders (*Bitis arietans*) born in the Gardens.